IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Appln. No:	10/505,387
Applicant:	Mario Engelmann
Filed:	August 20, 2004
Title:	METHOD AND CIRCUIT SYSTEM FOR CALIBRATING VOLTAGE AND TEMPERATURE DEVIATIONS OF THE EFFECTIVE CURRENT OF HYDRAULIC VALVES IN A PWM DRIVE
TC/A.U.:	2838
Examiner:	Richard V. Muralidar
Confirmation No.:	7211
Docket No.:	PC10373US
Notice of Appeal Filed:	December 9, 2009

SUPPLEMENTAL APPEAL BRIEF UNDER 37 C.F.R. § 41.37

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Commissioner for Patents
P. O. Box 1450
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SIR:

This Supplemental Appeal Brief is filed in reply to the February 1, 2010 Notification of Non-Compliant Appeal Brief. Appellants respectfully submit that this Supplemental Appeal Brief addresses the issues raised in the Notification and is fully compliant.

Appellants hereby request consideration and reversal of the Final Rejection dated April 1, 2009, of claims 13, 14, 16 and 19-29.

This Brief is presented in the format required by 37 C.F.R. § 41.37, in order to facilitate review by the Board. In compliance with 37 C.F.R. § 41.37(a)(1), the original Brief was filed within the time allowed for response to the action from which the Appeal was taken or within two months from the date of the Notice of Appeal, whichever was later.

The necessary fees were paid in conjunction with the filing of the original Appeal Brief on January 19, 2010.

I. REAL PARTY IN INTEREST

The real party in interest in this appeal is the following party: Continental Teves AG & Co. oHG.

II. RELATED APPEALS AND INTERFERENCES

There are no related appeals or interferences related to the subject matter of this Appeal.

III. STATUS OF CLAIMS

Claims 13, 14, 16 and 19-29 are pending and stand finally rejected. Claims 1-12, 15 and 17-18 are canceled. Claims 13, 14, 16 and 19-29 are the subject of this appeal.

IV. STATUS OF AMENDMENTS

No amendments have been filed subsequent to the final rejection.

V. SUMMARY OF THE CLAIMED SUBJECT MATTER

All references to the specification of the patent application presented hereinafter refer to the originally-filed clean copy of the substitute specification.

As set forth in pending independent claim 13, the presently claimed invention relates to a method for generating a corrected nominal current in a pulse-width-modulated current control for electronic brake control units of motor vehicles (see the specification at page 1, lines 5-11 and page 2, lines 24-28).

According to the method of claim 13, a measured current is determined at a certain predetermined time during an actuation period. As explained in the specification at page 4, lines 12-16, it is necessary to measure the present coil current at a defined time for the purpose of current control. With reference to Figure 1, the measured current is determined at predetermined time $t_{on}/2$. At that time the measured current is equal to the nominal current (see equation #3).

According to the method of claim 13, a compensation is executed by way of at least one compensation current value that is determined in response to a supply voltage. As explained in the specification at page 5, lines 12-19, nominal current is dependent upon voltage. As explained in the specification at page 6, lines 7-27, a compensation current value ΔI is made available to compensate for the voltage dependency. The compensation current value ΔI is stored in a data memory and corresponds to a pre-defined nominal current value and pre-defined voltage value. Intermediate compensation current values are calculated by interpolating the stored compensation current values ΔI. See also page 3, lines 1-8.

According to the method of claim 13, the compensation current value is added to the measured current so that the corrected nominal current is available for current control. As explained in the specification at page 6, lines 7-27, to achieve a corrected nominal current a compensating current value is added to the nominal current. As stated previously, at the time of the current measurement, the measured current is equal to the nominal current (see equation #3). Thus, the compensating current value is added to the measured current value to generate the corrected nominal current.

As set forth in independent claim 29, the presently claimed invention relates to a method for generating a corrected nominal current in a pulse-width-modulated current control for a current actuated valve (see the specification at page 1, lines 5-11 and page 2, lines 24-28).

The method of claim 29 comprises the step of determining a measured current at a predetermined time during an actuation period of the valve. As explained in the specification at page 4, lines 12-16, it is necessary to measure the present coil current at a defined time for the purpose of current control. With reference to Figure 1, the measured current is determined at predetermined time $t_{on}/2$. At that time the measured current is equal to the nominal current (see equation #3).

The method of claim 29 further comprises the step of determining at least one compensation current value based on a supply voltage. As explained in the specification at page 5, lines 12-19, nominal current is dependent upon voltage. As explained in the specification at page 6, lines 7-27, a compensation current value ΔI is made available to compensate for the voltage dependency. The compensation current value ΔI is stored in a data memory and corresponds to a pre-defined nominal current value and pre-defined voltage value. Intermediate compensation current values are calculated by interpolating the stored compensation current values ΔI. See also page 3, lines 1-8.

The method of claim 29 further comprises the step of adjusting the measured current by the compensation current value to generate the corrected nominal current. As explained in the specification at page 6, lines 7-27, to achieve a corrected nominal current a compensating current value is added to the nominal current. As stated previously, at the time of the current measurement, the measured current is equal to the nominal current (see equation #3). Thus, the compensating current value is added to the measured current to generate the corrected nominal current.

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

Whether claims 13, 14, 16 and 19-29 are unpatentable under 35 U.S.C. § 103(a) as obvious in view of the combination of U.S. Patent No 4,398,252 to Frait and U.S. Patent No. 6,322,166 to Furuya et al.

VII. ARGUMENT

Rejection of claims 13, 14, 16 and 19-29 under 35 U.S.C. § 103(a) as obvious in view of the combination of U.S. Patent No 4,398,252 to Frait and U.S. Patent No. 6,322,166 to Furuya et al.

Claims 13, 14, 16 and 19-29 stand rejected under 35 U.S.C. §103 as unpatentable over U.S. Patent No. 4,398,252 (Frait) in view of U.S. Patent No. 6,322,166 (Furuya et al.). Appellants respectfully traverse these rejections.

"To establish a prima facie case of obviousness, ... the prior art reference (or references when combined) must teach or suggest all the claim limitations." M.P.E.P. §2143. Additionally, as set forth by the Supreme Court in KSR Int'l Co. v. Teleflex, Inc., No. 04-1350 (U.S. Apr. 30, 2007), it is necessary to identify a reason that would have prompted a person of ordinary skill in the relevant field to combine the prior art elements in the manner claimed.

Independent claim 13 recites a "[m]ethod for generating a corrected nominal current in a pulse-width-modulated current control, in particular for electronic brake control units of motor vehicles, wherein a measured current is determined at a certain predetermined time during an actuation period and a compensation is executed by way of at least one compensation current value determined in response to a supply voltage, the compensation current value being added to the measured current so that the corrected nominal current is available for current control."

The Office Action cites Frait as teaching a method of generating a corrected nominal current including determining a measured current and executing a compensation by way of compensation variables which are added to the measured current. Applicants respectfully submit that Frait fails to teach or suggest such for the following reasons.

Contrary to the assertion in the Office Action, Frait does not disclose "wherein a measured current is determined at a certain predetermined time during an actuation period." The Office Action characterizes Column 7, lines 2-5 and 31-35 as disclosing this step. Applicants respectfully disagree and submit that the foregoing passage merely indicates that transistor 92 "senses" a voltage increase in the event of a short circuit.

Sensing a voltage increase can not be fairly characterized as analogous to determining a measured current. Frait does not disclose or suggest that a current level or a current value is measured. Additionally, Frait teaches that transistor 92 senses a voltage increase in the event of a short circuit. A short circuit does not occur at a "predetermined time during an actuation period." Generally speaking, short circuits occur randomly.

Contrary to the assertion in the Office Action, Frait also does not teach or suggest any compensation current value that is added to the measured current to achieve a corrected nominal current. The Office Action cites to several passages of Frait as teaching compensation variables, however, none of these variables are a compensation current **value that is added** to a measured current so that a corrected nominal current is available for current control. While Frait may disclose that "[t]he transistor 61 compensates the output of the transistor 58 for changes in voltage and temperature" at column 6, lines 5-9, Frait does not disclose that a compensation current value is added to any other variable.

The current Office Action does not cite to Furuya et al. as teaching or suggesting the step of determining a compensation current value based on supply voltage that is added to the nominal current so that the corrected nominal current is available for current control. To the contrary, in response to the December 17, 2007 Amendment explaining that Furuya et al. does not teach compensation variables, the March 28, 2008 Office Action withdrew the previous §102 rejection based on Furuya et al., thereby confirming that Furuya et al. does not teach the claimed invention.

The current Office Action now cites to Furuya et al. as teaching that the supply voltage measurement and temperature measurement are added to each other to compensate a final control signal. However, as explained in the December 17, 2007 Amendment, Furuya et al. simply teaches the use of the regenerative current for determining the position of the plunger 303. Furuya et al. explains at column 7, lines 7-10, which is the paragraph immediately following the citation in the Office Action, that based on the voltage and temperature measurements relied on in the Office Action, "a certain relationship of correspondence can always be preserved between **the response waveform of the regenerative current and the plunger position, allowing accurate detection of the opening degree (plunger position)**." (emphasis added).

Referring to Figs. 5(a) - 5(c) of Furuya et al., the regenerative current I_2 does not equal the coil current I_1, and, therefore, does not correspond to the claimed corrected nominal current available for current control. To the contrary, Furuya et al. simply teaches the use of the regenerative current for determining the position of the plunger 303. Furuya et al. explains at column 12, 23-32, "[t]he regenerative current I_2 has different waveforms in accordance with an inductance characteristic varying with a clearance of said air gap G. Specifically, as shown in FIG. 6(b), an inductance L varies with the magnitude of the dimension of the air gap G. And as shown in FIG. 6(a), a value of the regenerative current I_2 varies with a variation in the dimension (ΔI in the drawing). Therefore, the dimension of the air gap G, i.e. the position of the plunger 303 can be detected out of a value of the regenerative current I_2 in the regenerative-current detection circuit." Furuya et al. does not teach a measured current at a predetermined time during an actuation period and compensating that measured current so that the corrected nominal current is available for current control.

Support for the regenerative current only being used for the position of the plunger is provided at Furuya et al. at column 14, lines 11-20 where it is explained that "[n]ext, at a step 93, based on a characteristic map of regenerative current as previously input, a gradient value X upon full opening and a gradient value Y upon full closing are obtained at the stored duty ratio. Specifically, the gradient value X upon full opening and the gradient value Y upon full closing for the regenerative current as shown in FIG. 10 are input as a characteristic map of regenerative current for every duty ratio, which are obtained at the step 93. Next, at a step 94, the position of the plunger is calculated by $\{(Z-Y)/(X-Y)\}*100$. Specifically, the position is obtained based on what is the ratio of the actual gradient value Z to the two gradient values X, Y."

The cited references, alone or in any reasonable combination, fail to teach or suggest each limitation of the claimed invention, as it is recited in claim 13. It is respectfully submitted that independent claim 13 is condition for allowance. Claims 14, 16, 19-28 each depend from claim 13 and should each be allowed for at least the reasons set forth above. It is respectfully submitted that each of these claims recite additional limitations which further distinguish over the prior art.

Similar to independent claim 13, independent claim 29 recites "[a] method for generating a corrected nominal current in a pulse-width-modulated current control for a current actuated valve, the method comprising the steps of: determining a measured current at a predetermined time during an actuation period of the valve; determining at least one compensation current value based on a supply voltage; and adjusting the measured current by the compensation current value to generate the corrected nominal current.

As explained above with reference to claim 13, the cited references, alone or in any reasonable combination, fail to teach or suggest (i) determining a measured current at a predetermined time during an actuation period, (ii) determining at least one compensation current value based on a supply voltage, and (iii) adjusting the measured current by the compensation current value to generate the corrected nominal current. It is respectfully submitted that independent claim 29 is also in condition for allowance.

VIII. CONCLUSION

In view of the arguments set forth above, all pending claims are patentable over the cited references. The rejection of all of the pending claims of record should therefore be reversed with instructions to issue a Notice of Allowability. Such actions are respectfully requested.

Respectfully Submitted,

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Enclosures: Claims Appendix
Evidence Appendix
Related Proceedings Appendix

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The Director is hereby authorized to charge or credit Deposit Account No. **18-0350** for any additional fees, or any underpayment or credit for overpayment in connection herewith.

CLAIMS APPENDIX

13. Method for generating a corrected nominal current in a pulse-width-modulated current control, in particular for electronic brake control units of motor vehicles,

wherein a measured current is determined at a certain predetermined time during an actuation period and a compensation is executed by way of at least one compensation current value determined in response to a supply voltage, the compensation current value being added to the measured current so that the corrected nominal current is available for current control.

14. Method as claimed in claim 13,

wherein the supply voltage dependency is compensated.

16. Method as claimed in claim 13,

wherein several loads are driven, and the compensation current value is fixed individually for each load, in particular for each valve coil.

19. Method as claimed in claim 13,

wherein an averaging operation is executed by way of the present nominal value and previous nominal values to compensate abrupt changes in nominal values.

20. Method as claimed in claim 27,

wherein the temperature is determined indirectly by way of the Duty Cycle adjusted by current control.

21. Method as claimed in claim 19,

wherein a sum of a coil resistor and a resistor of a connected semiconductor component for driving the load is taken into consideration for the determination of temperature.

22. Method as claimed in claim 19,

wherein the Duty Cycles of several PWM periods are averaged for temperature measurement or the determination of the indirect temperature value.

23. Method as claimed in claim 19,

wherein the nominal resistance value of the coil is used at the presently measured or estimated temperature of the control unit for the average value of the indirectly determined temperature quantity directly after the switching on of the ignition, in particular after the ignition's re-start.

24. The method as claimed in claim 13 wherein the method is implemented as a program in a microcomputer or microcomputer system which is electrically connected to a PWM circuit.

25. The method as claimed in claim 13 wherein the method is implemented at least in part by digital logic.

26. Method as claimed in claim 13 wherein compensation current values are stored in a table and an interpolation is carried out for supply voltages lying between two table values in order to determine the at least one compensation current value.

27. Method as claimed in claim 13 further comprising determining a second compensation current value based on temperature.

28. Method as claimed in claim 27 wherein compensation current values are stored in a table and an interpolation is carried out for temperatures lying between two table values in order to determine the second compensation current value.

29. A method for generating a corrected nominal current in a pulse-width-modulated current control for a current actuated valve, the method comprising the steps of:

determining a measured current at a predetermined time during an actuation period of the valve;

determining at least one compensation current value based on a supply voltage; and

adjusting the measured current by the compensation current value to generate the corrected nominal current.

EVIDENCE APPENDIX

None

RELATED PROCEEDINGS APPENDIX

None